FILING TOOL FOR HARDENED-SKIN CARE AND METHOD OF MANUFACTURING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates, in general, to filing tools for hardened-skin care and manufacturing methods thereof. More specifically, the present invention is directed to a filing tool suitable for use in the care of hardened-skin, including the nail, the elbow, and the sole of a foot, comprising a plurality of filing parts arranged on a metal plate, and a method of manufacturing the same.

2. Description of the Related Art

In general, filing tools for use on fingernails and hardened-skin have been manufactured by various methods. For example, the filing tools are obtained by subjecting a metal surface thereof to a mechanical processing to form fine recesses and protrusions, or by forming fine protrusions by means of a chemical corrosion, or by attaching a filing material onto a metal plate by use of an adhesive.

However, thusly manufactured filing tools to care for fingernails and hardened-skin are disadvantageous in that parts of filed impurities after such a tool is used for

predetermined periods are inserted into the recesses or filing materials or the attached filing material is separated from the tool, thus decreasing filing performance.

In addition, there are proposed techniques for forming a plurality of perforated holes on a filing surface of the filing tool to easily remove impurities.

However, since sufficient strength is required for the filing tool not to be curved upon filing, the numbers and intervals of the holes are limitedly formed on the filing surface.

Thus, limitations are imposed on the removal of impurities, whereby fingernail care or hardened-skin care can be rough.

Korean Utility Model No. 20-0253679 discloses a filing tool, characterized in that removing recesses for removing impurities are formed on a copper foil of a base via a corrosion process, and the copper foil, with the exception of corroded portions, is attached with a filing material, such as white alumina, having high hardness, mixed in a plating solution via an electroplating process. Thereby, filing parts having a desired filing performance by high hardness and roughness are provided, together with removing recesses capable of directly removing filed impurities.

However, the above technique is disadvantageous in terms of low productivity due to complicated processes,

including forming the copper foil on the base, etching the formed copper foil to form the etched portions to be removing recesses, and fixing white alumina to the non-etched portions to form filing parts. Further, since the base is made of a synthetic resin material, it should be thick to maintain a desired strength.

SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to alleviate problems encountered in the related art and to provide a filing tool for hardened-skin care, characterized in that a plurality of filing parts have double plated nickel and stone powders securely fixed to such nickel on a metal plate, thus achieving no separation of the stone powders from the metal plate, high filing efficiency, higher strength due to the use of the metal plate as a base.

Another object of the present invention is to provide a method of manufacturing the filing tool.

To achieve the above objects, according to a first embodiment of the present invention, there is provided a filing tool for hardened-skin care, comprising a plurality of filing parts formed on a metal plate, wherein the filing parts each include a first nickel-plated layer, a second nickel-plated layer, and stone powders fixed between the

first and second nickel-plated layers.

According to a second embodiment of the present invention, there is provided a method of manufacturing a filing tool for hardened-skin care comprising a plurality of filing parts formed on a metal plate, the method comprising setting a patterned photosensitive dry film on the metal plate, exposing the metal plate set with the dry film to light, removing a non-exposed portion of the dry film to form a masking pattern, plating nickel on the metal plate formed with the masking pattern to form a first nickel-plated layer, followed by uniformly applying stone powders on the first nickel-plated layer, further plating nickel on the stone powders to form a second nickel-plated layer, and fixing the stone powders between the first nickel-plated layer and the second nickel-plated layer, followed by removing the masking pattern.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be better understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a filing tool for nail care according to an embodiment of the present invention;

FIG. 2 is a cross-sectional view taken along the line A-A of FIG. 1; and

FIG. 3 is a perspective view of a filing tool for hardened-skin care according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Based on the present invention, a filing tool for hardened-skin care is obtained by nickel-plating a metal plate formed with a masking pattern, uniformly dispersing stone powders over the metal plate, and further nickel-plating the metal plate to fix the stone powders to a nickel-plated surface. Hence, the filing tool is advantageous in terms of high filing efficiency due to the stone powders securely fixed to nickel, and higher strength of the metal plate than that of conventional synthetic resins. In the present invention, 'hardened-skin' is used as a concept including not only hardened-skin formed around the heel and sole of a foot, or the elbow, but also keratinous skin, such as fingernails and toenails.

Hereinafter, a detailed description will be given of a filing tool for hardened-skin care and a method of manufacturing the same, with reference to the appended drawings.

FIGS. 1 and 2 show a filing tool for use in hardened-skin care manufactured by the inventive method. As shown in FIGS. 1 and 2, a plurality of filing parts 12 having predetermined shapes are arranged on a metal plate 11. Further, respective removing recesses 13, serving to remove dead skin resulting from filing hardened-skin, are formed between the adjacent filing parts 12. The filing part 12 includes a first nickel-plated layer 15a and a second nickel-plated layer 15b, and stone powders 14, in which the stone powders 14 are fixed between the first and second nickel-plated layers 15a and 15b on the metal plate.

Before the setting of a dry film as a first step of the present invention, the metal plate 11 as a base is previously subjected to the series of processes of cutting, acid-cleaning and deburring. Specifically, the metal plate 11 is cut to a predetermined size for easy work, after which the surface of the metal plate 11 is acid-cleaned, and then impurities are removed (deburred) from the metal plate 11.

In particular, as the metal plate 11, preference is given to using stainless steel. Also, the variation of the cutting dimension of the metal plate 11 is maintained in the range of ±2 mm. It is important that stainless steel as a base material is maintained without scratches after removing a releasing paper from the stainless steel. In addition, upon the acid-cleaning, the acid used is preferably

hydrochloric acid. With the aim of increasing a contact force of a photosensitive dry film, a deburring process is repeatedly performed until the impurities on the metal plate 11 are completely removed. As such, there should be no moisture on the metal plate 11.

Subsequently, a patterned photosensitive dry film is set on the metal plate 11 (1^{st} step).

As the patterned dry film, use is taken of commercially available ones in the form of films by large companies in Korea and foreign countries. Such a dry film is roll coated and placed on the metal plate 11. In such a case, it is noted that the dry film is flatly positioned thereon in such a way that it does not come off the metal plate 11 while unfolded. As well, the dry film should not have impurities. To prevent partial disposition of the patterns of the dry film, the dry film should be accurately set on the metal plate 11. Since defective rates increase when the patterned film is undesirably placed, the setting state of the film should be confirmed.

Then, with the aim of forming a pattern, the metal plate 11 united with the patterned photosensitive film is exposed to chemical radiation (2^{nd} step).

The patterned dry film includes an exposed portion transmitted with chemical radiation, such as ultraviolet light, and a non-exposed portion that is not transmitted

with ultraviolet light. The exposed portion of the dry film is cured by ultraviolet light.

The exposing process is performed under 7-8 kW of ultraviolet light for 10-12 sec, depending on the kinds and properties of the photosensitive film. Exposure to ultraviolet light, according to normal standards provided by manufacturers of photosensitive films, is understood to those skilled in the art.

Thereafter, the non-exposed portion of the dry film is removed to form a masking pattern on the metal plate 11 (3^{rd} step).

Of the dry film, a portion that is not exposed to ultraviolet light is present in the state of not cured, and thus chemically removed by sodium carbonate (Na_2CO_3). The exposed portion of the dry film in the state of cured remains on the metal plate 11 to form a predetermined pattern, which is referred to as a masking pattern.

The masking pattern-formed portion, that is, the exposed portion is removed following a nickel-plating process as defined later, therefore resulting in removing recesses 13 of the filing tool. Whereas, the portion without the masking pattern, that is, the non-exposed portion is plated with nickel to form the first and second nickel-plated layers 15a and 15b, which constitute the filing part 12.

Subsequently, the masking pattern-formed metal plate 11 is plated with nickel and uniformly applied with stone powders 14 (4^{th} step).

The first nickel-plated layer 15a is preferably 0.20-0.30 μm thick (nickel strike). If the nickel-plated layer 15a is not in the above thickness range, a contact force of the nickel strike decreases. In particular, the layer 15a is less than 0.20 μm, the stone powders are difficult to securely fix thereon.

The stone powders 14 should be uniformly dispersed over the metal plate 11 to form a predetermined distribution. Examples of the stone powders include white alumina powders, or ultra small diamond. In cases of the filing tool for nail care, the stone powders have a particle size of 10-15 μm. Meanwhile, in cases of the filing tool for hardened-skin care, the stone powders have an average particle size of 20-25 μm.

As for nickel-plating, the metal plate 11 obtained from the 3^{rd} step is immersed in a nickel-plating solution and electroplated. As such, the stone powders are uniformly dispersed over the metal plate 11 in the state of being applied with electricity. Alternatively, the metal plate 11 which is connected to a negative electrode may be immersed into the nickel-plating solution containing the stone powders 14, and then electroplated. In addition, the

application of the nickel and the stone powders on the metal plate may be carried out by various methods so long as an electroplating process is performed.

The second nickel-plated layer 15b is further formed on the stone powders 14 fixed to the first nickel-plated layer 15a on the metal plate 11 (5^{th} step).

To prevent the separation of the stone powders 14 fixed to the first nickel-plated layer 15a, nickel is further electroplated on the stone powders 14 for 15-20 min, to form the second nickel-plated layer 15b having a thickness of 8-10 μm.

After the stone powders 14 are fixed between the first and second nickel-plated layers 15a and 15b, the masking pattern is removed (6^{th} step).

The removal (separation) of the masking pattern should be performed after the nickel-plated layers are sufficiently cured in such a way that the stone powders are firmly fixed to the nickel-plated layers. Thereby, the filing parts are less damaged. Moreover, the masking pattern formed at the 3^{rd} step, which is a non-nickel-plated portion, is removed at 6^{th} step and thus formed to be the removing recesses 13, serving to remove dead skin resulting from filing hardened-skin.

Further, according to another aspect of the present invention, between the 3^{rd} step and the 4^{th} step, the metal

plate formed with the masking pattern is cleaned ultrasonically, and then acid-cleaned, followed by activating the surface of the metal plate.

As such, the ultrasonic-cleaning process is performed to remove the non-exposed portion of the film unnecessarily remaining on the metal plate. Preferably, as a component capable of removing impurities by activating the surface of the metal plate, commercially available Ferra-BU is used. That is, the metal plate is ultrasonicated for about 1 min once to remove the impurities.

The acid-cleaning process is carried out to remove an oxidation film of the metal plate. For example, 10% hydrochloric acid is used for 30 sec (once) to eliminate the oxidation film.

The activation of the surface of the metal plate is required to improve a contact force between the metal plate and the nickel. For example, the surface of stainless steel as the metal plate is activated for about 1 min in a range of not bubbling using Makpan82 commercially available as a surfactant (S/S activation).

Furthermore, according to still another aspect of the present invention, the metal plate subjected to the 6^{th} step is acid-cleaned, and the surface thereof is activated, after which a nickel-plating process is repeated. Thereby, the surface gloss of the filing tool can be increased.

Selectively, an additional gloss treatment may be carried out, or a protective coating film may be formed. In addition, stains generated during the above processes may be ultrasonic-cleaned.

Finally, the metal plate is placed into a dryer and dried at 70-80°C for 10-15 min, cut to a desired shape, confirmed for sizes thereof, and subjected to common post-treatment, such as trimming, so as not to generate burrs, thereby completing the filing tool of the present invention.

Thusly manufactured filing tool is attached to a plastic body as shown in FIG. 3, and used for care of hardened-skin, say, around the sole and heel of a foot, or the elbow. The filing tool shown in FIG. 3 is manufactured by attaching the injection-molded body with the metal plate having the filing parts by use of an adhesive, or by an insert-injecting process, which is understood to those skilled in the art.

As for the filing tool for hardened-skin care, the filing parts 12 and the removing recesses 13 are variously patterned, and filing efficiencies are controlled depending on the sizes of the filing parts 12. Thereby, the filing tool is manufactured in the form suitable for use in hardened-skin care or nail care.

Having generally described this invention, a further understanding can be obtained by reference to specific

preparative examples which are provided herein for the purposes of illustration only and are not intended to be limiting unless otherwise specified.

EXAMPLE 1

A metal plate of stainless steel was cut, from which a releasing paper for surface protection was separated. Further, impurities on the surface of the metal plate were removed, and the surface thereof was cleaned with hydrochloric acid (10%) and then dried, after which a patterned photosensitive dry film was roll coated on a whole surface of the metal plate.

Subsequently, the metal plate set with the patterned photosensitive dry film having a pattern of filing parts where circular shapes are repeatedly arranged was exposed to halogen lamp (8 kW) for 11 sec.

Thereby, the photosensitive dry film was irradiated with ultraviolet light, and a portion transmitted with ultraviolet light (transparent portion in the dry film) was cured. The non-cured portion in the dry film was removed with sodium carbonate (Na_2CO_3) and developed, thus forming a desired masking pattern.

The metal plate formed with the masking pattern was immersed into a nickel-plating solution and electroplated,

to form a first nickel-plated layer having a thickness of 0.25 μm, on which powders of white alumina having an average particle size of 20 μm were dispersed. Thereafter, a second nickel-plated layer being 9 μm thick was further formed on the white alumina powders, after which it was completely cured. Hence, the white alumina powders were firmly fixed between the first and second nickel-plated layers, and then the masking pattern was removed.

Thusly obtained product was ground to increase gloss and cut according to product standards, and subjected to common post-treatment, such as trimming, to manufacture a desired filing tool for hardened-skin care.

EXAMPLE 2

A filing tool for hardened-skin care was manufactured in the same manner as in Example 1, with the exception that 10% Ferra-BU was used for ultrasonic cleaning for 1 min after the masking pattern had been formed, and 10% hydrochloric acid was used for 30 sec to remove an oxidation film of the metal plate, and Makpan82 was applied for 1 min to increase a contact force of the metal plate, followed by a nickel-plating process.

As described above, the present invention provides a

filing tool for hardened-skin care and a manufacturing method thereof. The filing tool of the present invention has a plurality of filing parts in which stone powders are securely fixed between a first nickel-plated layer and a second nickel-plated layer on a masking pattern-formed metal plate. Thereby, since such stone powders, serving as a filing material, are not separated from the metal plate, filing efficiencies improve. In addition, the filing tool is advantageous in terms of high strength due to the use of the metal plate as a base.

The present invention has been described in an illustrative manner, and it should be understood that the terminology used is intended to be in the nature of description rather than of limitations. Many modifications and variations of the present invention are possible in light of the above teachings. Therefore, it should be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.